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ABSTRACT

This study was undertaken in the fall of 1987 to investigate the differences between schools with long-established and newer instructional computing programs, and to test the assumption that experience indicates superior program quality. Seventy-three elementary schools believed to have developed outstanding instructional computing programs were divided into two groups according to the longevity of their instructional computing programs and surveyed to determine: (1) the ratio of students to computers; (2) the ratio of computers to teachers; (3) total computer-related expenditures; (4) total computer budgets for a 2-year period; (5) the presence or absence of computer expenses as a permanent budget line item; (6) the number of years for which instructional computing programs were planned; (7) the extent of teaching staff involvement; and (8) the allocation of computer time to programming, computer-assisted learning, and other applications. The established program group surpassed the newer group in all measurable categories, leading to the conclusion that program quality generally corresponds to program maturity. It was also found that the established group devoted more time to computer applications and less to computer-assisted learning than the newer group. Data for each of the variables for the two groups are displayed in a table. (NRP)

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THE EXPERIENCE FACTOR IN ELEMENTARY COMPUTING

by

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Does the length of time in schools which use computers instructionally influence important characteristics of their instructional computing programs? Although traditional wisdom holds that deeper understanding accompanies experience, most of today's popular microcomputer applications either did not exist or were not widely available until five or fewer years ago. Recently developed instructional computing programs have certainly benefitted from the technological advances of the past half decade. But have the instructional computing programs used the acquired knowledge obtained by the efforts of earlier programs in a meaningful way? Does the traditional wisdom apply to technological settings so that new adopters of computing are likely to repeat, rather than benefit from, the experiences of their instructional forerunners? A reasonable assumption would posit that the educators in schools which had the most instructional computing experience would use their computers differently and, perhaps, more wisely than schools with less instructional computing experience.

However, the leaders of schools with more recently developed computing programs have a greater body of literature concerning educational computing from which to draw and learn, providing them with a number of approaches described by research studies. Long established programs may be fixed in their instructional computing practices while more newly developed programs may have more opportunity to avail themselves of

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advances in either the technology or the methods of using it. Therefore, more recently established programs could reasonably duplicate or surpass the more established computing programs. The issues call for clarification.

In a recent study investigating instructional computing, program maturation was included as an important variable to determine the effects of program longevity on instructional computing practices. A national search identified seventy-three elementary schools for the high quality of their instructional computing programs. The Office of Technical Assessment in Washington, D.C., supplied a list of districts known for their support of instructional technology. Representatives from these districts then identified the particular elementary schools in their districts which they believed had developed the most outstanding instructional computing programs.

These schools were then surveyed (with a 70% response rate) using an instrument designed to gather data on selected topics relating to their instructional computing programs. The program comparisons considered the following instructional computing program characteristics: the ratio of students to computers, the ratio of computers to teachers, the total expense on computer-related items, the 1986 computer budget, the 1987 computer budget, the presence or absence of computer expenses as permanent line items in the budget, the number of years for which instructional computing plans have accounted, the extent of teaching staff involvement, and the actual and ideal allocation of the available computer access time. The results of these comparisons are displayed in Table I.

To investigate the issues involving program maturation, the schools in the study were stratified into two groups according to the length of time for which their instructional computing programs have existed. The schools whose programs had existed for four or fewer years (the Newer group) were compared to the schools whose programs had existed for seven or more years (the Established group).

The two demographic ratios of interest (students per computer and computers per teacher) both reveal substantial differences between the two groups of schools. The Established group has a mean of 16.6 students per computer while the Newer group has a ratio of 21.5 students per computer. This difference means that nearly 30% more computers are available for each student in the Established schools than in the schools of the Newer group.

The Established schools also have a correspondingly superior ratio in the number of computers available for each teacher. The Established schools have a mean of 2.2 computers for each teacher; the Newer schools have a mean of 1.4 computers per teacher. This difference establishes that teachers in the schools of the Established group have nearly 57% more computer availability per teacher than do teachers in the schools of the Newer group.

The four comparisons involving budgetary considerations also reveal substantial differences between the Established and the Newer schools. The data verified the anticipated findings concerning budget: the

equipment advantages enjoyed by the Established schools implied that they expended more money on the purchase of their equipment.

The Established group spent 46% more money on the total amount of computer-related items in its buildings than the schools of the Newer group. In addition, the 1986 budgets of the Established schools were 22% higher than those of the Newer group, while the 1987 budgets were 18% higher. All three comparisons are consistent with the equipment ratios previously presented. The three sets of budgetary figures are also consistent with the study's general finding that computer related expenses of all schools are dropping significantly.

The final budgetary comparison concerned the presence or absence of computer-related expenses as permanent line items in school budgets. The investigation showed that 58% of the schools in the Established group include computer expenses as permanent line items in their budgets, compared to less than 7% of the schools in the Newer group. This finding is consistent with the results from the other examinations of budgetary factors. For all four budgetary considerations--total expenses on computer-related items, the 1986 budgets, the 1987 budgets, and the presence or absence of computer expenses as permanent line items in the budgets--the characteristics of the Established schools differ considerably from the characteristics of the schools in the Newer group. Furthermore, in each situation, those differences demonstrate that the Established schools are actually more progressive than the Newer schools in terms of both budgeting and creating a supportive environment in which successful instructional can thrive.

The next factor examined involves an important element of the planning process guiding the instructional computing program development--that is, the number of years accounted for by their planning. In the Newer group, 53% of the schools planned for only the current year, compared with only 33% of the Established schools. On average, the Established schools have planned for the next 2.75 years, while the Newer schools have planned for only the next 1.9 years. Again, there are significant differences between the characteristics of the two groups of schools, with the schools in the Established group planning for a nearly 45% longer period of time.

Another factor--as important as either planning or budgeting--is the extent of the teaching staff involvement in the instructional computing programs. The mean involvement level for the Newer group of schools is 57% of the staff; for the Established group, the involvement level is 85% of the staff. In addition, 67% of the Established schools have achieved total staff involvement (100%), compared to 41% of the schools in the Newer group, indicating that a much higher level of teaching staff involvement exists in the instructional computing programs of the Established schools.

Naturally, none of these factors is relevant without computer availability, and the way a school allocates computer access time has a clear impact on the overall quality of the program. If computers are not available, they cannot be used wisely, but simple computer availability does not guarantee wise usage. The instructional uses supported in a computer program are critical in determining its success. For that reason, the

allocation of the available computer access time is the final aspect examined between the two groups' instructional computing programs.

The data show that the most significant differences exist in the manner schools in the two groups allocate the roughly 80% of the computer access time devoted to computer applications and computer-assisted learning. The Established group devotes nearly 14% more time to computer applications than the schools in the Newer group. The Newer group allocates a similarly greater amount of its available computer access time (13%) to computer-assisted learning than the schools in the Established group. The mean time allocation for all schools in the study (see Table I) is 14% for computer programming such as work in Logo or B.A.S.I.C., 55% for computer-assisted learning such as tutorials or drill and practice software, 29% for computer applications such as word processing or data base managers, and 2% for any other uses. The mean computer access time allocation for the Schools in the Established group is 16% for computer programming, 46% for computer-assisted learning, 35% for computer applications, and 3% for any other uses. The mean time allocation for the Schools in the Newer group is 18% for computer programming, 59% for computer-assisted learning, 21% for computer applications, and 2% for other uses.

Clear differences are also apparent in the manner that instructional leaders in the two groups report they would ideally like to allocate their available computer time. Of the total available time, the leaders of the Established group would devote 9% to programming, 40% to computer-assisted learning, and 51% to computer applications. By comparison, the leaders of

the Newer group would like to allocate their available time according to the following formula: 19% to programming, 46% to computer-assisted learning, and 35% to computer applications. Both groups project substantial increases in the amount of time devoted to applications (up 16% for the Established group and 14% for the Newer group from actual allocations).

Both groups also project declines in the amount of time devoted to computer-assisted learning, although the decrease for the Newer group (13%) is greater than for the Established group (6%). The Established group also projects a proportionally substantial decrease in the time devoted to programming (down from 16% to 9% of the total time) while the Newer group actually projects a small increase in the time allocated to programming (up from 18% to 19%). The two groups differed substantially both in the way they actually allocate their available computer time and in the way they would ideally like to allocate the computer time. The Established schools clearly place more emphasis on using the computer as a "tool" with an application program while the Newer schools emphasize the computer's role as a tutor with a computer-assisted learning program.

Each of the instructional computing program characteristics examined --equipment availability, budgetary considerations, the number of years for which plans have been made, the extent of teaching staff involvement, and the actual and ideal allocation of computer access time--reveal substantial differences between the two groups. The Established schools have developed plans covering longer periods of time and have established permanent budget line items to ensure the funds needed to implement the

plans. The Established schools involve a greater number of teachers in their programs and provide a greater ratio of computers to both teachers and students. The Established programs also place significantly more emphasis on computer applications than on computer programming and computer-assisted learning.

The length of time for which instructional computing programs have existed appears to influence many important characteristics of the programs. Although the differences are often predictable, the findings, nevertheless, tend to support the accepted maxim that experience makes a difference. Naturally, instructional computing programs which have been established for longer periods of time have been able to acquire more computer equipment and spend more money on its acquisition. These programs have also had more time to involve their teaching staffs in the instructional computing programs and have had more opportunity to establish solid budgetary foundations for implementing their programs. Since these program considerations require substantial time to develop, it seems likely that recently established instructional computing programs will be some years in achieving the level of program maturity presently demonstrated by the Established schools. However, other aspects of instructional computing programs such as allocation of computer access time are more easily controlled by the educational leaders and any guidance newly established programs receive from the acquired wisdom of the more established schools' instructional computing program leaders is valuable.

Other instructional aspects in which the more mature programs differ from the newly established programs are less predictably associated with time than those already discussed. The essential consideration of any educational computing program obviously is how the machines are used. The established schools allocate their computer access time in substantially different manners than the schools with more newly established programs--devoting 67% more time to computer applications and 28% less time to computer-assisted learning. This difference offers a strong message to educators unsure about which computer mode to emphasize in their programs. Using the "computer as a tool" is strongly emphasized in the more mature programs.

The more mature programs also develop plans which encompass significantly more time than the more recently established programs. This consideration is also within the control of educational leaders in a given school. The leaders can combine an awareness of the importance of computer applications in their program with longer term plans which include increased opportunities for teacher training and staff involvement in the planning process. Although the Established schools, the pioneers of instructional computing, appear to have created more stable environments in which instructional computing programs can flourish, guidance is available to all educators willing to consider the direction these programs can provide.

These findings have implications for educational leaders at the building, district, and state levels as well as for educational researchers. The results warrant more detailed investigations into the factors which might be

influenced by an instructional computing program's relative maturity. Most important, the findings offer decision-making guidelines to assist the developmental processes of the nation's more newly established elementary school instructional computing programs. In terms of instructional computer usage, new programs can learn lessons from their elders.

TABLE I Program Maturity Comparisons

Instructional Computing Program Considerations	Findings for the schools with Established Programs	Findings for the schools with Newer Programs
Ratio of students/computer	16.5	21.5
Ratio of computers/teacher	2.2	1.4
Mean Total computer expense	\$75 000	\$51 250
Mean 1986 computer budget	\$11 832	\$7 256
Mean 1987 computer budget	\$ 9 699	\$6 167
Percent with permanent line item	58%	7%
Mean number of planning years	2.75	1.9
Mean level of staff involvement	85%	57%
% of schools with 100% involvement	67%	41%
Actual allocation of computer time	16%, 46%, 35%*	18%, 59%, 21%*
Ideal allocation of computer time	9%, 40%, 51%*	19%, 46%, 35%*

*programming%, computer-assisted learning%, computer applications%